AN2862
Application note

Demonstration board user guidelines for the TS2007FC 3 W filter-free class D audio amplifier with 6-12 dB fixed gain select

Introduction

This application note concerns the TS2007FC demonstration board, designed to evaluate the class D audio differential amplifier TS2007FC.

This document provides:

- a brief description of the TS2007FC device.
- a description of the demonstration board and all of its components.
- the layout of the demonstration board.

About the TS2007FC

The TS2007FC is an audio power class D amplifier that can drive up to 1.4 W into an 8 Ω load at 5 V. It achieves better efficiency compared to a typical class AB audio power amplifier.

This device allows switching between two different gains: 6 or 12 dB via a logic signal on the GS pin. Pop and click reduction circuitry provides low on/off switch noise while allowing the device to start within 1 ms. A standby function (active low) reduces the current consumption to 1 µA typical. The TS2007FC also integrates an output short-circuit protection mechanism and thermal shutdown protection to avoid damage to the amplifier.

Key features of the TS2007FC

- Operating range from V_{CC} = 2.4 to 5.5 V.
- Standby mode active low.
- Output power: 1.4 W at 5 V or 0.5 W at 3.0 V into 8 Ω with 1% THD+N maximum.
- Output power: 2.3 W at 5 V or 0.75 W at 3.0 V into 4 Ω with 1% THD+N maximum.
- Two fixed gain selects: 6 or 12 dB.
- Low current consumption.
- Efficiency: 88% typical.
- Signal-to-noise ratio: 90 dB typical.
- PSRR: 68 dB typical at 217 Hz with 6 dB gain.
- PWM base frequency: 280 kHz
- Low pop and click noise.
- Thermal shutdown protection.
- Output short-circuit protection.
- Flip-chip lead-free 9-bump package.

Refer to the datasheet for complete information on the TS2007FC.

1 Description of the evaluation board

The TS2007FC demonstration board is designed for the TS2007FC class D audio differential amplifier. The TS2007FC device, in a flip-chip package, is mounted on a two-layer PCB. Easily-accessible connectors on the board allow changing or driving the gain select and standby control pins, as well as changing the input configuration of the TS2007FC.

The TS2007FC's gain can be set to either 6 or 12 dB via the P1 connector (see *Table 1*).

The **input configuration** is either capacitor-coupled or common-mode feedback. On the evaluation board, the JP3 and JP4 connectors allow you to change the input configuration.

In the **capacitor-coupled configuration**, the -3 dB cut-off frequency in Hz is:

$$\frac{1}{2\pi \cdot Z_{in} \cdot C_1} = \frac{1}{2\pi \cdot Z_{in} \cdot C_2}$$

with Z_{in} in Ω (Z_{in} = 75 kΩ typically), C in Farads and C1 = C2.

More information about component calculations is available in the TS2007FC datasheet.

Table 1. Evaluation board connectors

Connector(s)	Description
JP1	Input signal connector (GND, In+, In-, GND).
JP1	Output signal connector (GND, Out-, Out+, GND).
JP3, JP4	Input configuration: – capacitor-coupled when JP3 and JP4 are open. – common-mode feedback when JP3 and JP4 are shorted by jumpers.
P1	Gain select control connector: – pins 1 and 2 are shorted or pin 2 is floating, the gain is 6 dB. – pins 2 and 3 are shorted, the gain is 12 dB. The connector pins are connected as follows: – 1 to V_{CC} – 2 to GS of the TS2007FC – 3 to GND
P2	Standby control connector: – pins 1 and 2 are shorted, the TS2007FC is in operation mode. – pins 2 and 3 are shorted, the TS2007FC is in standby mode. The connector pins are connected as follows: – 1 to V_{CC} – 2 to STANDBY of the TS2007FC – 3 to GND
JP5	Power connector (V_{CC} and GND). Power supply voltage from 2.4 to 5.5 V.

Caution: When you apply the power supply through JP5, **do not** invert the polarity since this will irreversibly damage the U1 amplifier.

Figure 1. Schematic diagram

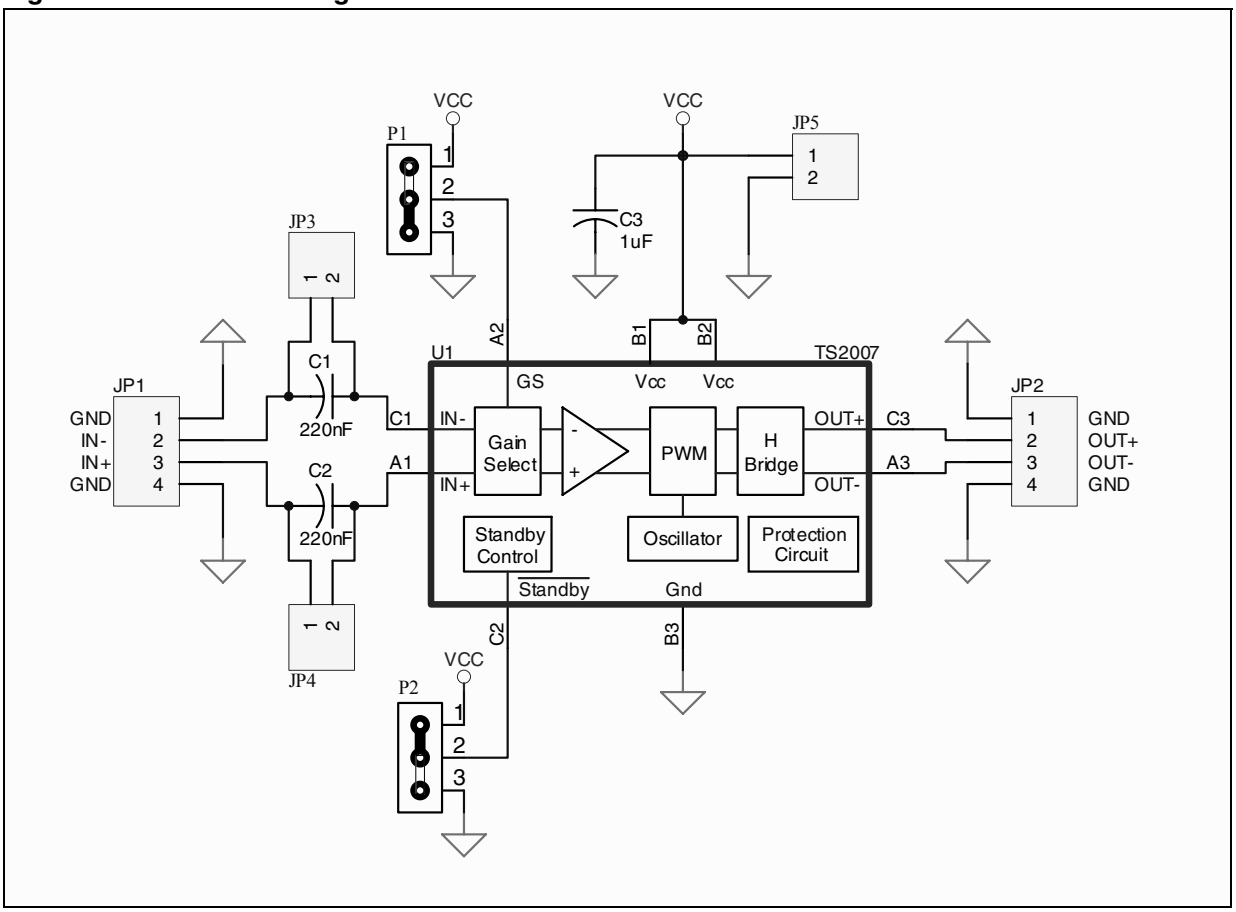


Table 2. Component list for the demonstration board

Designation	Quantity	Description
C1, C2	2	220 nF/16 V, SMD ceramic capacitors, 0603
C3	1	1 µF/16 V, SMD ceramic capacitor, 0603
JP1, JP2	2	4-pin header 2.54 mm pitch
JP3, JP4, JP5	3	2-pin header 2.54 mm pitch
P1, P2	2	3-pin header 2.54 mm pitch
U1	1	TS2007EIJT

2 Demonstration board layout

The following figures depict the top view and layers of the demonstration board.

Figure 2. PCB top layer

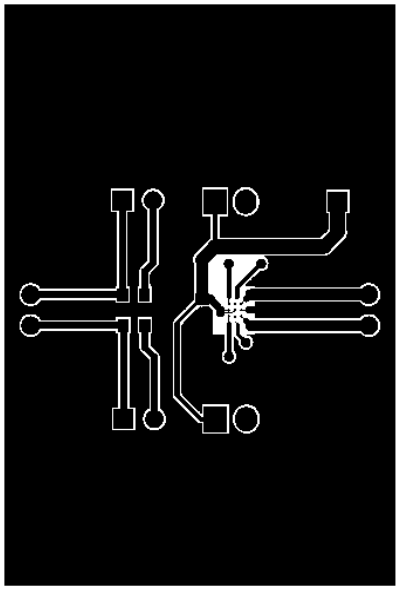
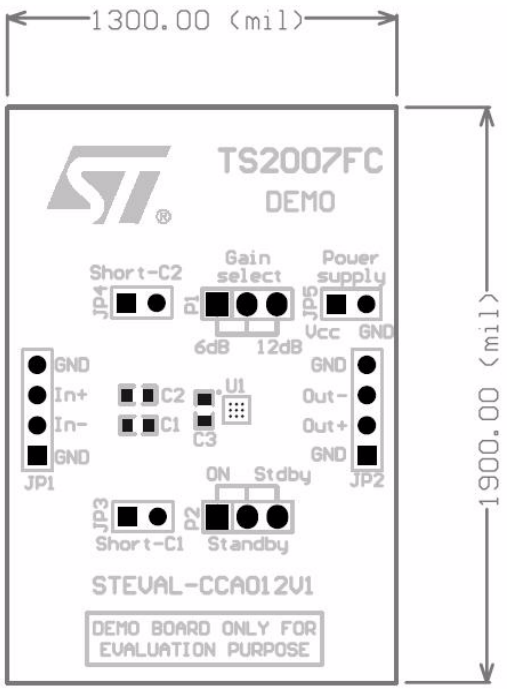


Figure 3. PCB bottom layer

Figure 4. Top view and dimensions of the demonstration board



3 Conclusion

To order the board online go to http://www.st.com/stonline/domains/buy/buy_dev.htm, and user the order code *STEVAL-CCA012V1*.

4 Revision history

Table 3. Document revision history

Date	Revision	Changes
06-Feb-2009	1	Initial release.

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